

REMARKS**Claim Amendments**

Claims 1-38 and 58-95 were pending in the application. Applicants have herein amended claims 1, 3, 58, and 60 in accordance with the Examiner's claim objections. No new matter is introduced by any of Applicants' claim amendments herein. Currently pending in the application are claims 1-38 and 58-95 as amended herein.

Arguments in Response to the Examiner's Rejections

The Examiner has rejected claims 1-8, 32, 36-37, 58-65, 89 and 93-94 under 35 U.S.C. 102(e) as being anticipated by Napier et al., U.S. Patent 6,483, 965, referred to hereinafter as NAPIER. On page 11 of the outstanding Office Action, the Examiner argues that "Napier states FIGURE 7 is a graph of the group delay as 'a function of the line placement error,' which the Examiner takes to mean the location of the errors relative to one another" (Underline for emphasis). Applicants strongly contest this interpretation of Figure 7 by the Examiner. Not only is the location of the errors relative to one another never mentioned in NAPIER, but to assign such an interpretation to the horizontal axis of Figure 7 would be in direct contradiction of all the teachings of NAPIER.

NAPIER first mentions the concept of line placement error in column 2, lines 21 to 24:

"Phase masks produced using electron beam lithography have extremely good precision over many lines, but there is a line placement error on each of the individual grating lines. This is because each line is exposed individually by the electron beam process."

In other words, the phase mask is manufactured by using a writing electron beam to write each line of the mask individually, and this electron beam needs to be precisely positioned with respect to the mask substrate. Misalignment of the writing beam will result in writing a line into the phase mask substrate at a slightly different position than was intended. The line placement error is therefore the positioning error associated with each line of the phase mask relative to the exact desired position of this line. Hence, the designation "*line placement error*".

The principles behind the teachings of NAPIER are well explained in column 6, lines 3 to 26 of the cited patent. NAPIER explains that line placement errors provide a limitation to the quality of the recorded Bragg grating and that this line placement error is a result of limitations in the interferometer accuracy used for position control, that is, control of the position of the writing electron beam when manufacturing the phase mask. NAPIER further notes that the grating written in an optical fiber using such a phase mask has an improved periodicity compared to this mask, that is, that it suffers from less line placement error effects, because the holographic fringe formation used to make this grating smoothes the random line placement error.

To take advantage of this averaging effect even further, NAPIER devises a two-stage process for writing a Bragg grating in an optical fiber. NAPIER first takes a phase mask manufactured using electron beam lithography or a similar technique and therefore exhibiting line placement errors, and uses it to photoinduce a grating in photoresist used for fabricating a second phase mask. As explained above, the grating in the photoresist has an improved periodicity with regards to the first phase mask, since the original line placement error has been smoothed. This grating is then etched into a substrate to make a second phase mask. Since the second phase mask is not manufactured using a line-by-line writing process, there is no additional line placement error introduced in the fabrication of this second phase mask, since it does not depend on the positioning of a writing electron beam. This second phase mask therefore has less line placement error than the first phase mask. The Bragg grating in the optical fiber is then written using this second phase mask.

The holographic recording process of the Bragg grating in the fiber further smoothes the line placement error effects from the second phase mask, which come from the manufacturing process of the first phase mask, resulting in an improved accuracy of the final grating. As mentioned by NAPIER, column 6, lines 35 and following, additional intermediate phase masks can be used, such that at each successive mask the line placement error effect from the first phase mask is reduced without adding additional line placement errors.

It follows from the explanations above that NAPIER's principal objective is to reduce the effect of line placement errors, which he considers a drawback of the manufacturing of phase masks using a writing electron beam.

With respect to the interpretation of Figure 7, the Examiner's attention is brought to column 8, lines 27 to 36 of NAPIER:

"The improved phase mask line positioning achieved by the invention thus enables the group delay ripple in a chirped fiber grating to be improved. FIG. 7 shows the relationship of Group Delay Ripple (GDR) in a chirped fiber grating (11.5 cm long) as a function of random phase error in the grating. Known chirped gratings may achieve a GDR of approximately 14-16 ps which is consistent with a random [phase] error of about 4.5 nm. A reduction of the phase error in the grating by a factor of ten, which can be achieved using a two stage mask writing process, can limit the GDR to below 2 ps."

It will be noted throughout the above paragraph that NAPIER's concern is to reduce the random phase error in the grating, which is a synonym of the line placement error. This is obvious from NAPIER'S use in the "Brief description of the drawings," column 4, line 18, of the expression "line placement error" to designate the same quantities. In fact, the use of the appellation "random phase error" also supports Applicants' argument that this quantity denotes the displacement of the lines of the grating with respect to the desired position of these lines, as it would be obvious to a person skilled in the art that the effect of displacing a line of a phase mask is to induce a phase in the resulting grating photoinduced by light transmitted through this mask. Hence the appellation "*random phase error*".

Additionally, the scale of the horizontal axis of Figure 7 is impossible to reconcile with the Examiner's interpretation. NAPIER mentions column 2, lines 32-33, that the typical grating pitch of the phase mask, that is the distance between two consecutive lines, is 1070 nm. This means that the distance between the line placement error on two consecutive lines is also of that order. Figure 7's random errors of 0 to 6 nm are therefore too fine to be possibly construed as a reference to the distance between the errors, but are consistent with positioning error of the actual position relative to the desired position of a given line.

Having thus established that NAPIER does not teach that the group delay ripple error decreases as the proximity of the errors in a phase mask get smaller, Applicants submit that the subject matter of each of independent claims 1 and 58 is new and inventive with respect to the cited reference. The Examiner's contention that to obtain a better phase mask one can increase the number of positioning errors therein to reduce the average effect thereof, is in direct contradiction with the teachings of NAPIER and of all known prior art. On the contrary, the industry's aim up to now has been to consider positioning errors as drawbacks of the method used to manufacture a phase mask, and considerable effort has been made to reduce or avoid line placement errors altogether. In view of the above, Applicants respectfully request the Examiner to withdraw his rejections of claims 1 and 58.

35 U.S.C. 103 Rejections:

The Examiner has rejected claims 9, 10, 17 to 20, 66, 67 and 74 to 77 under 35 U.S.C. 103, as being unpatentable over NAPIER in view of Clements et al., U.S. Patent 6,084,995 (hereinafter referred to as CLEMENTS). Since these claims depend respectively either directly or indirectly from independent claims 1 or 58, and therefore include all of the limitations of the independent claim, and since Applicants believe that claims 1 and 58 are patentable for the reasons explained above, it is respectfully submitted that these claims are not obvious in view of the cited prior art.

Moreover, Applicants submit that the Examiner is mistaken in his interpretation of CLEMENTS.

It is the Examiner's contention that CLEMENTS teaches the use of having different periods in the grating by modifying the scaling factor. However, it is respectfully submitted that CLEMENTS does not change the period by adjusting a scaling factor. A scaling factor is a parameter in the manufacturing tool. The rule disclosed by CLEMENTS is a mathematical representation of the variation of the period, not a scaling factor.

The Examiner further states that the grating disclosed by NAPIER, having different periods for the purpose of using the grating to effect several different polarizations of the incident light, would have been obvious to a person of ordinary skill in the art at the time the invention was made. There is no mention of polarization in CLEMENTS. Respectfully, it seems to the Applicants that the Examiner mistook polarization and wavelength.

It is consequently respectfully submitted that claims 9 and 66 are new and inventive and are therefore allowable in view of the cited prior art.

Regarding claims 10 and 67, according to the arguments presented above, it is respectfully submitted that these claims are new and inventive and the Examiner is respectfully requested to withdraw his rejection.

Regarding claims 17 to 20 and 74 to 77, the Examiner states that it would have been obvious to a person of ordinary skill in the art at the time the invention was made, to have a grating having sub-segments with a variety of characteristics as taught by CLEMENTS for the purpose of increasing the applicability of the invention and to induce more errors which could decrease the group delay ripple. However, CLEMENTS does not teach sub-segments. The lines of the segments of Figure 2 of CLEMENTS, as disclosed in column 4, lines 1 to 44 of CLEMENTS, are not the sub-segments as defined in the present invention.

It is therefore respectfully submitted that claims 17 to 20 and 74 to 77 are allowable in view of the cited prior art.

The Examiner rejects claims 11 to 16, 21 to 26, 34, 35, 68 to 73, 78 to 83, 91 and 92 under 35 U.S.C. 103, as being unpatentable over NAPIER in view of Lee, U.S. Patent 5,909,313 (hereinafter referred to as LEE).

Since these claims respectively depend directly or indirectly from independent claim 1 or 58, and accordingly include all of the limitations of these independent claims, and since Applicants believe that claims 1 and 58 are allowable for the reasons given above, it is respectfully submitted that these claims are not obvious in view of the cited prior art.

Moreover, Applicants respectfully submit that the Examiner is mistaken in his interpretation of LEE. LEE does not teach or suggest the same pixel as the pixel recited in the present claims. The pixel location of the present invention is the writing grid of the writing machine, which is a few nanometers (nm). The pixels disclosed by LEE are areas of few micrometers (μm) defined by the designer with no reference to the real pixels of the manufacturing machine. The Examiner particularly refers to column 5, lines 13-14 to reject these claims. However, LEE does not teach or suggest a periodic grid of 10 nm, but rather 10 μm (micrometers), which is 1000 times larger.

Further, Applicants respectfully submit that the Examiner is mistaken in his interpretation of NAPIER. As shown above, NAPIER does not show that as the proximity of errors decreases, the average error decreases. Applicants have shown above that the Examiner's interpretation of NAPIER is contrary to all of the teachings of NAPIER. Accordingly, the Examiner's combination of NAPIER and LEE cannot teach or suggest all of the limitations of any of Applicants' claims 11 to 16, 21 to 26, 34, 35, 68 to 73, 78 to 83, 91 or 92.

Therefore, it is respectfully submitted that claims 11 to 16, 21 to 26, 34, 35, 68 to 73, 78 to 83, 91 and 92 are new and inventive in view of the cited prior art, and the Examiner is respectfully requested to withdraw his rejections of these claims.

The Examiner rejects claims 27 to 31, 33, 84 to 88 and 90 under 35 U.S.C. 103 as being unpatentable over NAPIER in view of Kuriharra et al., U.S. Patent 6,466,714 (hereinafter referred to as KURIHARA). Applicants agree with arguments presented by the Examiner. However, since these rejected claims respectively depend from independent claim 1 or 58, and consequently include the limitations of claim 1 or 58, they are believed to be allowable in view of the cited prior art. Accordingly, the Examiner is respectfully requested to withdraw his rejections of these claims.

The Examiner has rejected claims 30 and 87, stating that NAPIER teaches repeating the writing step for multiple exposures. The Examiner further states that the use of two masks inherently means that writing step must be repeated for multiple exposures. However, the multiple exposures recited in claims 30 and 87 mean exposing many times the same position of the same phase mask. The use of two masks by NAPIER is a totally different concept. A first mask is exposed and a second mask is exposed (once) by using the first mask.

Therefore, Applicants respectfully submit that claims 30 and 87 are new and inventive and are consequently allowable in view of the cited prior art.

Finally, the Examiner has rejected claims 38 and 95 as being unpatentable over NAPIER in view of Starodubov et al., U.S. Patent 6,344,298. However, since claims 38 and

95 include the limitations of allowable claim 1 or 58 respectively, they are believed to be allowable in view of the cited prior art.

Response to the Examiner's Objections

Applicants have herein amended claims 1, 3, 58, and 60 in accordance with the Examiner's claim objections. Applicants accordingly submit that claims 1 and 58 are allowable and respectfully request the Examiner to withdraw his objections and to pass claims 1 and 58 to issue.

Claims 2-38 and 59-95 depend directly or indirectly from base claim 1 or claim 58 and accordingly inherit all of the limitations of their respective base claim. Since claims 1 and 58 are allowable, claims 2-38 and 59-95 are also allowable for the same reasons. All of the Examiner's objections and rejections of claims 2-38 and 59-95 are therefore believed to be moot. The Examiner is accordingly respectfully requested to remove all of his objections and rejections of claims 2-38 and 59-95 and to pass these claims to issue.

Conclusion

Claims 1-95 were originally pending in the Application. Claims 39-57 were withdrawn from consideration pursuant to the Examiner's Restriction Requirement. Claims 1-38 and 58-95 were rejected by the Examiner. Applicants have herein amended claims 1, 3, 58, and 60. Claims 1-38 and 58-95, as herein amended, are currently pending in the application.

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to pass this application to issue.

Application No.: 09/957,443

Docket No.: 64626/P001CP1/10302976

Applicant believes \$110.00 extension fee is due with this response, and a check in that amount is enclosed. If any additional fees are due during the pendency of this application, please charge our Deposit Account No. 06-2380, under Order No. 64626/P001CP1/10302976 from which the undersigned is authorized to draw.

Dated: February 20, 2004

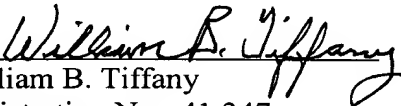
Respectfully submitted,

I hereby certify that this correspondence is being deposited with the U.S. Postal Service as Express Mail, Airbill No. EV255076070US, in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on the date shown below.

Dated: February 20, 2004

Signature: 

Jay M. Perigo

By 
William B. Tiffany
Registration No.: 41,347
FULBRIGHT & JAWORSKI L.L.P.
2200 Ross Avenue, Suite 2800
Dallas, Texas 75201-2784
(214) 855-8204
(214) 855-8200 (Fax)
Attorney for Applicant